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**NAME OF THE TRANSLATOR :** Seung -Ji Kim

**SIGNATURE :** Seung Ji Kim

**Date :** July 31, 2008

**RESIDENCE :** MIHWA BLDG., 110-2, MYONGRYUN-DONG 4-GA,  
CHONGRO-GU, SEOUL 110-524, KOREA

**CITIZENSHIP :** REPUBLIC OF KOREA

*Translation of Priority Document*

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Applicant(s) : Samsung Electronics Co., Ltd.

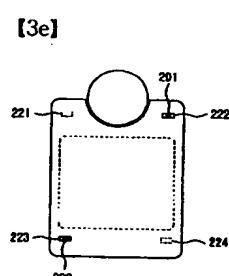
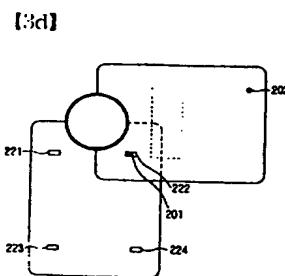
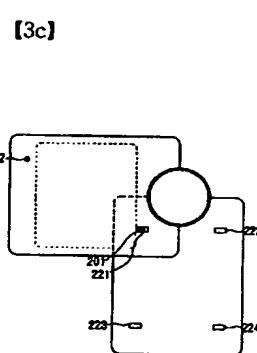
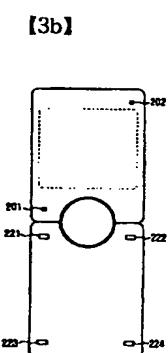
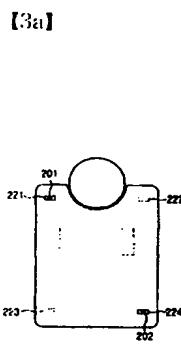
**COMMISSIONER**

## [ABSTRACT OF THE DISCLOSURE]

### [ABSTRACT]

Disclosed is a device for displaying a picture in a mobile terminal, which comprises: a direction detecting section consisting of at least one magnet fixed within the mobile terminal and a plurality of sensors for detecting the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

### [REPRESENTATIVE FIGURE]



### [INDEX]

magnet, hole sensor, protrusion part

**[SPECIFICATION]**

**[TITLE OF THE INVENTION]**

DEVICE AND METHOD FOR DISPLAYING PICTURE IN WIRESS TERMINAL

**[BRIEF DESCRIPTION OF THE DRAWINGS]**

FIG. 1 is a block diagram showing the structure of a mobile communication terminal according to the present invention;

FIG. 2 is a view showing the structure of a display section of the mobile terminal in FIG. 1;

FIGs. 3a to 3e are views for explaining the operation of a mobile terminal according to a first embodiment of the present invention;

FIGs. 4a to 4e are views for explaining the operation of a mobile terminal according to a second embodiment of the present invention;

FIGs. 5a to 5e are views for explaining the operation of a mobile terminal according to a third embodiment of the present invention;

FIG. 6 is a flow chart showing a process of controlling a displaying operation of a mobile terminal according to the first to third embodiments of the present invention;

FIG. 7 is a flow chart showing another process of controlling a displaying operation of a mobile terminal according to the first to third embodiments of the present invention;

**[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT]**

**[OBJECT OF THE INVENTION]**

**[RELATED FIELD AND PRIOR ART OF THE INVENTION]**

The present invention relates to a device and a method for displaying a picture in a mobile terminal, and more particularly to a device and a method for detecting the direction in which a mobile terminal is turned and controlling the display direction of a picture.

It is a current trend that mobile communication terminals are becoming more integrated than existing mobile telephones for voice communication to perform high-speed data transmission. IMT-2000 mobile communication network services enable high-speed data transmission as well as voice communication through mobile terminals. In other words, mobile terminals can process both packet data and image data in an IMT-2000 network. Mobile terminals equipped with a camera or a TV receiver can also display moving pictures. A mobile terminal with an embedded camera can take pictures and display them as moving or still pictures. Also, it is possible to send the pictures to another mobile terminal. A mobile terminal with a TV receiver can display received video or image signals.

However, mobile terminals display pictures in a single fixed direction, regardless of the position of the terminals. Accordingly, viewers can see the pictures displayed only in a fixed direction on the mobile terminals. When a terminal is turned at a certain angle relative to the plane on which it stands, the resulting orientation of the displayed pictures does not match that of the pictures perceived by the viewer. More specifically, when a terminal is turned an angle of 90°, pictures displayed are also turned 90°. The viewer has to tilt his or her head to one side at the same angle to see normal pictures.

#### **[TECHNICAL OBJECT TO BE ACHIEVED BY THE INVENTION]**

Accordingly, the present invention has been made to solve the above-mentioned problems occurring in the prior art, and one object of the present invention is to provide a device and a method for automatically controlling the display direction of pictures on a mobile terminal to enable a viewer to see the pictures in an upright position,

regardless of the direction in which the mobile terminal is turned.

Another object of the present invention is to provide a mobile terminal comprising sensors for detecting the display direction of pictures and capable of controlling the display direction according to the output from the sensors, thereby always producing the pictures in an upright direction, regardless of the direction in which the terminal is turned, and a method for controlling the display direction in the mobile terminal. Still another object of the present invention is to provide a device and a method for displaying a picture on a mobile terminal in an upright direction to the eyes of a viewer, regardless of the direction in which the terminal is turned, and adjusting the size of the picture according to the direction of a display section of the terminal.

In accordance with one aspect of the invention for accomplishing the above objects, there is provided a device for displaying a picture in a mobile terminal, which comprises: a direction detecting section consisting of at least one magnet fixed within the mobile terminal and a plurality of sensors for detecting the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a camera module for taking an image signal; an image processing section for processing the image signal taken by the camera module in a display picture size; a direction detecting section consisting of at least one magnet fixed within the mobile terminal and a plurality of sensors for detecting the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting

signal is generated, in a direction turned  $90^\circ$  counter-clockwise when a second direction detecting signal is generated, in a direction turned  $180^\circ$  when a third direction detecting signal is generated, or in a direction turned  $270^\circ$  counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a tuner for receiving a composite television video signal broadcasted on a selected channel; a decoder for decoding the composite video signal to generate an analog video signal and a synchronizing signal; a video processing section for converting the analog video signal into a digital video data, processing the digital video data in a frame size and outputting a frame video signal and user data in the frame; a direction detecting section consisting of at least one magnet fixed within the mobile terminal and a plurality of sensors for detecting the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned  $90^\circ$  counter-clockwise when a second direction detecting signal is generated, in a direction turned  $180^\circ$  when a third direction detecting signal is generated, or in a direction turned  $270^\circ$  counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a direction detecting section consisting of at least one projection fixed on the mobile terminal and a plurality of sensors for detecting the projection in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned  $90^\circ$  counter-clockwise when a second direction detecting signal is generated, in a direction turned  $180^\circ$  when a third direction detecting signal is generated, or in a direction turned  $270^\circ$  counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

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In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a camera module for taking an image signal; an image processing section for processing the image signal taken by the camera module in a display picture size; a direction detecting section consisting of at least one projection fixed on the mobile terminal and a plurality of sensors for detecting the projection in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a tuner for receiving a composite television video signal broadcasted on a selected channel; a decoder for decoding the composite video signal to generate an analog video signal and a synchronizing signal; a video processing section for converting the analog video signal into a digital video data, processing the digital video data in a frame size and outputting a frame video signal and user data in the frame; a direction detecting section consisting of at least one projection fixed on the mobile terminal and a plurality of sensors for detecting the projection in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture

data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a direction detecting section consisting of at least one projection and at least one magnet fixed on or in the mobile terminal and a plurality of sensors for detecting the projection or the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a camera module for taking an image signal; an image processing section for processing the image signal taken by the camera module in a display picture size; a direction detecting section consisting of at least one projection and at least one magnet fixed on or in the mobile terminal and a plurality of sensors for detecting the projection or the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a tuner for receiving a composite television video signal broadcasted on a selected channel; a decoder for decoding the composite video signal to generate an analog video signal and

a synchronizing signal; a video processing section for converting the analog video signal into a digital video data, processing the digital video data in a frame size and outputting a frame video signal and user data in the frame; a direction detecting section consisting of at least one projection or at least one magnet fixed on or in the mobile terminal and a plurality of sensors for detecting the projection or the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a direction detecting section consisting of a magnet fixed within the mobile terminal and a plurality of sensors for detecting the polarity of the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention there is provided a device for displaying a picture in a mobile terminal, which comprises: a direction detecting section consisting of a magnet fixed within the mobile terminal, first and second sensors for detecting the N pole of the magnet and third and fourth sensors for detecting the S pole of the magnet in order to detect the direction in which the mobile terminal is turned according to the pole detected by one of the four sensors and generate first to fourth direction detecting signals; a control section for outputting picture data in

an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In accordance with still another aspect of the invention, there is provided a device for displaying a picture in a mobile terminal, which comprises: a direction detecting section consisting of a magnet fixed within the mobile terminal and first and second sensors for detecting the N and S poles of the magnet in order to detect the direction in which the mobile terminal is turned according to the pole detected by one of the two sensors and generate first to fourth direction detecting signals; a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and a display section for displaying the picture data.

In order to accomplish the above objects of the present invention, one aspect of the invention provides a method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one fixed magnet and a plurality of sensors for detecting the magnet, said method comprising the steps of: detecting a direction signal informing the direction in which the mobile terminal is turned, using the sensors for detecting the magnet; when no direction signal is received from the sensors, making the same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction; when a second direction signal is detected, outputting and displaying the picture data in a direction turned 90° counter-clockwise; when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, outputting and displaying the picture data in a direction turned 270° counter-clockwise.

In accordance with another aspect of the invention, there is provided a method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one fixed magnet and a plurality of sensors for detecting the magnet, said method comprising the steps of: detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the magnet; when no direction signal is received from the sensors, making the same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction; when a second direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 90° counter-clockwise; when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 270° counter-clockwise.

In accordance with still another aspect of the invention, there is provided a method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection and a plurality of sensors for detecting the projection, said method comprising the steps of: detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the projection; when no direction signal is received from the sensors, making the same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction; when a second direction signal is detected, outputting and displaying the picture data in a direction turned 90° counter-clockwise; when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, outputting and displaying the picture data in a direction turned 270° counter-clockwise.

In accordance with still another aspect of the invention, there is provided a method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection and a plurality of sensors for detecting the projection, said method comprising the steps of: detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor

contacting the projection; when no direction signal is received from the sensors, making the same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction; when a second direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 90° counter-clockwise; when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 270° counter-clockwise.

In accordance with still another aspect of the invention, there is provided a method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection, at least one magnet and a plurality of sensors for detecting the projection or the magnet, said method comprising the steps of: detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the projection or the magnet; when no direction signal is received from the sensors, making the same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction; when a second direction signal is detected, outputting and displaying the picture data in a direction turned 90° counter-clockwise; when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, outputting and displaying the picture data in a direction turned 270° counter-clockwise.

In accordance with still another aspect of the invention, there is provided a method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection, at least one magnet and a plurality of sensors for detecting the projection or the magnet, said method comprising the steps of: detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the projection or the magnet; when no direction signal is received from the sensors, making the same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction; when a second direction signal is detected, generating full size picture data and

displaying the picture data in a direction turned 90° counter-clockwise; when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 270° counter-clockwise.

In accordance with still another aspect of the invention, there is provided a method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of a fixed magnet and a plurality of sensors for detecting the polarity of the magnet, said method comprising the steps of: detecting the polarity of the magnet by one of the sensors; detecting a direction signal informing the direction in which the mobile terminal is turned according to the detected polarity; when a first direction signal is detected, outputting and displaying picture data in an upright direction; when a second direction signal is detected, displaying the picture data in a direction turned 90° counter-clockwise; when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, displaying the picture data in a direction turned 270° counter-clockwise.

#### **[CONSTRUCTION AND OPERATION OF THE INVENTION]**

Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawings. In the drawings, the same element, although depicted in different drawings, will be designated by the same reference numeral or character. Also, in the following description of the present invention, a detailed description of known functions and configurations incorporated herein will be omitted when it may make the subject matter of the present invention rather unclear.

In the following description of the preferred embodiments of the invention, a mobile terminal with a camera or a TV receiver will be explained. However, the present invention is equally applicable to all general mobile terminals having neither a camera nor a TV receiver.

FIG. 1 is a block diagram showing the structure of a mobile communication terminal equipped with a camera according to the present invention.

Referring to FIG. 1, an RF section 123 performs a wireless communication function of a mobile terminal. The RF section 123 comprises a RF transmitter for performing upward conversion and amplification of the frequency of a signal, which is being transmitted, and an RF receiver for amplifying a signal, which is being received, with low noise and performing downward conversion of the frequency of the signal. A data processing section 120 comprises a transmitter for coding and modulating a signal which is being transmitted and a receiver for demodulating and decoding a signal which is being received. The data processing section 120 may be composed of a modem and a codec. The codec comprises a data codec for processing packet data and an audio codec for processing an audio signal such as a speech signal. An audio processing section 125 reproduces an audio signal outputted from the audio codec of the data processing section 120 or transmits an audio signal generated from a microphone to the audio codec of the data processing section 120.

A key input section 127 is provided with keys for inputting numbers and characters and function keys for setting up various functions. The key input section 127 may additionally include a picture direction control key for manually controlling the display direction of pictures. A memory 130 may be composed of a program memory and a data memory. The program memory includes programs for controlling the display direction of pictures on the mobile terminal to enable a viewer to see the pictures in an upright position. Also, the data memory can temporarily store data generated during implementation of the above programs.

A control section 110 controls the overall operations of the mobile terminal. The control section 110 may include the data processing section 120. The control section 110 detects the display direction of pictures and controls the mobile terminal to display the pictures in an upright direction in respect to the eyes of the viewer.

A camera module 140 is used to take pictures of an object on which its lens focuses. The camera module 140 comprises a camera sensor for converting a photographed optical signal into an electric signal and a signal processor for converting an analog image signal photographed by the camera sensor into digital data. Supposing that the camera sensor is a CCD (charge coupled device) sensor, the signal processor can be a DSP (digital signal processor). The camera sensor and the signal processor can be either integrated into a single element or separated as independent

elements.

An image processing section 150 generates picture data for displaying an image signal outputted from the camera module 140. The image processing section 150 processes image signals outputted from the camera module 140 in frames. Also, the image processing section 150 adjusts the frame image data to conform to the features, such as size and resolution, which are displayable on the display section 160, and outputs the adjusted frame image data. The image processing section 150 comprises an image codec, and compresses the frame image data displayed on the display section 160 in a preset manner or restore the compressed frame image data to the original frame image data. The image codec is selected from a variety of still or moving picture codecs, such as JPEG codec, MPEG4 codec or Wavelet codec. The image processing section 150 has an OSD (on screen display) function. The image processing section 150 can output OSD data according to the displayed picture size under the control of the control section 110.

The display section 160 displays image data outputted from the image processing section 150 or user data outputted from the control section 110. The display section 160 can be an LCD comprising an LCD controller, a memory for storing image data and an LCD device. When the LCD is a touch screen, it can serve as an input section.

FIG. 2 shows the structure of the display section 160 according to the present invention.

Referring to FIG. 2, the display section 160 has a first display area 161 for displaying image signals and a second display area 163 for displaying user data. The display section 160 may additionally have a third display area 165 for displaying information about soft keys for setting up a menu to enter a display mode. In the present invention, it is assumed that the display section 165 includes all of the first to third display areas 161 to 165. The first display area 161 displays an image in QCIF size. The second display area 163 displays user data. The third display area displays information for guiding a use in operating soft keys. It is assumed that the three display areas of the display section 160 have different sizes as shown in FIG. 2. The first display area 161 displays a QCIF picture having 176 x 144 pixels in a normal state. Also, it is assumed that a full picture displayed on the entire display section 160 has 176

x 220 pixels.

Assuming that the second display area 163 for displaying user data and sub-menus has a size of 176 x 60 pixels which is a font size (18 x 19 pixels) x 3 lines, character data consisting of 60 characters (pixels) can be displayed in the second display area 163. If a margin corresponding to a size of 3 characters is given, a total of 57 characters can be displayed. If user data and menus are stored in the memory 131 according to such characteristics of the second display area 163, they can be effectively displayed in the picture display mode.

The picture display mode refers to a mode showing image data photographed by a camera module of a mobile camera phone or television signals received by a TV receiver-equipped mobile terminal. The photographed image data or the television signals are displayed in the first display area 161. The user data depending on such display is shown in the second display area 163.

A direction detecting section 170 detects in what direction the mobile terminal is turned and outputs a direction detecting signal to the control section 110. The direction detecting section 170 can be formed in a diversity of structures.

FIGs. 3a to 3e are views showing the operation of the direction detecting section 170 according to the first embodiment of the present invention. In the first embodiment, it is assumed that the mobile terminal has four direction sensors in a main housing and two fixed magnets in a folder housing. It is also assumed that the direction sensors for detecting four directions of the display section 160 of the mobile terminal are Hall sensors (Hall effect ICs). The positions and numbers of the sensors and the magnets may vary depending on the types of mobile terminals.

Referring to FIGs. 3a to 3e, the direction detecting section 170 consists of two magnets 201 and 202 fixed within the folder of the mobile terminal and four Hall sensors 221 to 224 mounted in the main housing to detect the magnets 201 and 202 and generate a direction detecting signal. However, there is no limitation in the positions of the magnets and the sensors. It is also possible to mount the magnets in the main housing and the sensors in the folder. For explanatory convenience, it is supposed that the folders in FIGs. 3b to 3e are turned respectively in a first direction (turned 0°), a fourth direction (turned 270° clockwise in opened state), a second direction (turned 90° counter-clockwise in closed state) and a third direction (turned 180° in opened state).

When the folder of the mobile terminal is closed as shown in FIG. 3a, the first and fourth Hall sensors 221 and 224 simultaneously detect the first and second magnets 201 and 202, respectively. If the folder of the mobile terminal is opened so that the first and fourth Hall sensors 221 and 224 cannot detect the first and second magnets 201 and 202 or if none of the Hall sensors outputs a direction detecting signal, the direction detecting section 170 will generate a first direction detecting signal. When the second Hall sensor 222 detects the first magnet 201 as shown in FIG. 3d, a second direction detecting signal is generated. When the first Hall sensor 221 detects the first magnet 201 as shown in FIG. 3c, a fourth direction detecting signal is generated. Also, when the second and third Hall sensors 222 and 223 simultaneously detect the first and second magnets 201 and 202 as shown in FIG. 3e, the direction detecting section 170 generates a third direction detecting signal.

The operation of a mobile terminal having the structure as shown in FIG. 1 will be explained in more detail with reference to FIGs. 2 and 3. When the folder is opened, the control section 110 controls the display section 160 to be in a display mode. The "display mode" includes both a communication mode and a mode for displaying image data photographed by the camera module 140.

In the display mode, the first to fourth Hall sensors 221 to 224 of the direction detecting section 170 detect the magnets 201 and 202 fixed in the mobile terminal according to the direction in which the folder of the mobile terminal is turned. The control section 110 reads the output from the direction detecting section 170 to determine the positional state (direction) of the folder of the mobile terminal.

If no output from the Hall sensors 221 to 224 is detected, the control section 110 will determine that the folder of the mobile terminal is turned  $0^\circ$  and opened in a normal upright direction. If an output from the second Hall sensor 222 is detected, the control section 110 will determine that the folder of the mobile terminal is turned  $90^\circ$  counter-clockwise in closed state. If an output from the first Hall sensor 221 is detected, the control section 110 will determine that the folder of the mobile terminal is turned  $270^\circ$  clockwise in opened state. If outputs from both the second Hall sensor 222 and the third Hall sensor 223 are simultaneously detected, the control section 110 will determine that the folder of the mobile terminal is turned  $180^\circ$  upside down in opened state. The control section 110 controls the direction of a picture to be displayed on the display

section 160 according to the output from the direction detecting section 170. The process of controlling the display direction of the display section 160 will be explained in more detail with reference to FIGs. 6 and 7.

FIG. 6 is a flow chart showing a process of displaying a picture on a mobile terminal according to the present invention. The process of displaying a picture on a mobile terminal having the direction detecting section 170 will be explained in detail with reference to FIG. 6.

Referring to FIG. 6, the control section 110 determines whether the mobile terminal is in the display mode at step 511. The display mode refers herein to a mode of displaying a picture on the display section 160 when the folder housing is opened to be apart from the main housing. Generally, the first display area 161 displays the initial setting, while the second display area 163 displays the date and time of the day and the third display area 165 displays the receiving sensitivity and the amount of remaining battery power. In a camera mode, an image photographed by the camera module 140 is processed through the image processing section 150 and displayed in the first display area of the display section 160. In a data communication mode and particularly in a character data communication mode, the first to third display areas 161 to 165 are all used to display character data. When an image mail is received, the first display area 161 displays the received image signal. As stated above, the first display area 161 displays an image in QCIF size.

At step 513, the control section 110 detects if an automatic display change mode is set in the display mode. The automatic display change mode refers to a mode of automatically controlling the direction of a picture displayed on the display section 160 according to a direction detecting signal outputted from the direction detecting section 170. If the automatic display change mode is not set, the control section 110 will display pictures only in a fixed direction (first direction, 0°), regardless of the output from the direction detecting section 170.

If the automatic display change mode is set, the control section 110 will determine whether a direction detecting signal has been outputted from the direction detecting section 170. When a direction detecting signal is outputted from the direction detecting section 170, the control section 110 detects the output at step 514 and reads the outputted direction detecting signal at step 515.

If no signal is outputted from the Hall sensors 221 to 224, the direction detecting section 170 will generate a first direction detecting signal at step 514. When the folder of the mobile terminal is closed as shown in FIG. 3a, the first and fourth Hall sensors 221 and 224 simultaneously detect the first and second magnets 201 and 202. However, if the folder of the mobile terminal is opened so that the first and fourth Hall sensors 221 and 224 cannot detect the first and second magnets 201 and 202, the direction detecting section 170 will generate the first direction detecting signal and the control section 110 will read the generated signal. Since the first direction detecting signal is generated when the folder of the mobile terminal is opened in an upright direction, pictures should be displayed in the upright direction. Therefore, at step 529, the control section 110 controls the display section 160 to display pictures in the upright direction. FIG. 3b shows a mobile terminal with its folder opened in the upright direction.

If the second Hall sensor 222 detects the first magnet 201, the direction detecting section 170 will generate a second direction detecting signal at step 514. Also, the control section 110 will read the generated second direction detecting signal at step 515. The generation of the second direction detecting signal means that the folder of the mobile terminal is turned 90° counter-clockwise in closed state. In such a condition, the display section 160 initially displays a picture in a direction turned 90° clockwise. The picture should be turned 90° counter-clockwise to be seen in the upright direction to the eyes of the viewer. Accordingly, upon detecting the second direction detecting signal at step 519, the control section 110 turns the picture data applied to the display section 160 90° counter-clockwise to be seen in the upright direction at step 521. At step 529, the control section 110 controls the display section 160 to display the picture in a direction turned 90° counter-clockwise. Thus, the viewer can see the picture in the upright position even when the folder of the mobile terminal is turned 90°. FIG. 3d shows a mobile terminal with its folder turned 90° counter-clockwise in closed state.

If the second Hall sensor 222 detects the first magnet 201 and at the same time the third Hall sensor 223 detects the second magnet 202, the direction detecting section 170 will generate a third direction detecting signal at step 514. Also, the control section 110 will read the generated third direction detecting signal at step 515. The

generation of the third direction detecting signal means that the folder of the mobile terminal is turned 180°. In such a condition, the display section 160 initially displays a picture upside down. The picture should be turned 180° again to be seen in the upright direction. Accordingly, the control section 110 turns the picture data applied to the display section 160 180° to be seen in the upright direction at step 525. At step 529, the control section 110 controls the display section 160 to display the picture in a direction turned 180° again. Thus, the viewer can see the picture in the upright position even when the mobile terminal is turned 180° upside down. FIG. 3e shows a mobile terminal with its folder turned 180°.

If the first Hall sensor 221 detects the first magnet 201, the direction detecting section 170 will generate a fourth direction detecting signal at step 514. Also, the control section 110 will read the generated fourth direction detecting signal at step 515. The generation of the fourth direction detecting signal means that the folder of the mobile terminal is turned 270° clockwise. In such a condition, the display section 160 initially displays a picture in a direction turned by the same angle. The picture should be turned 270° counter-clockwise to be seen in the upright direction. Accordingly, upon detecting the fourth direction detecting signal at step 519, the control section 110 turns the picture data applied to the display section 160 270° counter-clockwise to be seen in the upright direction at step 527. At step 529, the control section 110 controls the display section 160 to display the picture in a direction turned 270° counter-clockwise. Thus, the viewer can see the picture in the upright position even when the mobile terminal is turned 270° clockwise. FIG. 3c shows a mobile terminal with its folder turned 270° clockwise.

As described above, the direction detecting section 170 detects the direction of the folder of the mobile terminal and then turns image data to be displayed on the display section 160 in the opposite direction so as to be seen in the upright direction. The viewer can always see pictures in the upright position, regardless of the direction of the folder of the mobile terminal. However, there may be a problem in displaying a particular size of pictures when the folder of the mobile terminal is turned in the second or fourth direction. A picture taken by the camera module can be normally displayed in QCIF size when the folder of the mobile terminal is opened upright or turned in the third direction. However, it is difficult to display the picture in QCIF size when the

folder of the mobile terminal is turned in the second or fourth direction. In such a case, it is preferable to display the picture in a full size.

When the folder of the mobile terminal is opened upright or turned in the third direction, image data in a fixed size, such as QCIF size, is displayed only after control of the direction of the visual display. When the folder of the mobile terminal is turned in the second or fourth direction, it is preferable to adjust and regenerate the size of such image data and control the direction of the visual display.

FIG. 7 is a flow chart showing another process of controlling the display of a picture on a mobile terminal according to the present invention. It is assumed that picture data is controlled to be displayed in QCIF size in the first or third direction and in a full size in the second or fourth direction. The process of controlling the display of a picture on a mobile terminal having the direction detecting section 170 will be described in detail with reference to FIG. 7.

Referring to FIG. 7, the control section 110 determines whether the mobile terminal is in the display mode at step 611. The display mode refers herein to a mode of displaying a picture on the display section 160 when the folder housing is opened to be apart from the main housing. The display mode in FIG. 7 is the same as that in FIG. 6. The control section 110 detects the display mode at step 611. Also, the control section 110 detects if an automatic display change mode is set in the display mode at step 612. The automatic display change mode is the same as that explained in FIG. 6.

If the automatic display change mode is set, the control section 110 will determine whether a direction detecting signal has been outputted from the direction detecting section 170. When a direction detecting signal is outputted from the direction detecting section 170, the control section 110 detects the output at step 613 and reads the outputted direction detecting signal at step 614.

If no signal is outputted from the Hall sensors 221 to 224, the direction detecting section 170 will generate a first direction detecting signal at step 613. When the folder of the mobile terminal is closed as shown in FIG. 3a, the first and fourth Hall sensors 221 and 224 simultaneously detect the first and second magnets 201 and 202. However, if the folder of the mobile terminal is opened so that the first and fourth Hall sensors 221 and 224 cannot detect the first and second magnets 201 and 202, the direction detecting section 170 will generate data in QCIF size as first picture data at

step 617. At step 635, the control section 110 controls the display section 160 to display the QCIF picture in the upright direction.

If the second Hall sensor 222 detects the first magnet 201, the direction detecting section 170 will generate a second direction detecting signal at step 613. Also, the control section 110 will read the generated second direction detecting signal at step 614. The generation of the second direction detecting signal means that the folder of the mobile terminal is turned 90° counter-clockwise in closed state. In such a condition, the display section 160 initially displays a picture in a direction turned 90° clockwise. The picture should be turned 90° counter-clockwise to be seen in the upright direction to the eyes of the viewer. Also, the display section 160 should generate second picture data to display a full size picture, rather than a QCIF size picture. Upon detecting the second direction detecting signal at step 619, the control section 110 controls the display section 160 to generate the second picture data in a full size at step 621. At step 623, the control section 110 turns the second picture data 90° counter-clockwise to be seen in the upright direction. At step 635, the control section 110 controls the display section 160 to display the second picture data in a direction turned 90° counter-clockwise. Thus, the viewer can see the picture in the upright position even when the folder of the mobile terminal is turned 90°.

If the second Hall sensor 222 detects the first magnet 201 and at the same time the third Hall sensor 223 detects the second magnet 202, the direction detecting section 170 will generate a third direction detecting signal at step 613. Also, the control section 110 will read the generated third direction detecting signal at step 614. The generation of the third direction detecting signal means that the folder of the mobile terminal is turned 180° in opened state. In such a condition, the display section 160 initially displays a picture upside down. The picture should be turned 180° again to be seen in the upright direction. Accordingly, upon detecting the third direction detecting signal at step 613, the control section 110 generates first picture data in QCIF size at step 627. At step 629, the control section 110 turns the first picture data applied to the display section 160 180° to be seen in the upright direction. At step 635, the control section 110 controls the display section 160 to display the first picture data in a direction turned 180° again. Thus, the viewer can see the picture in the upright position even when the mobile terminal is turned 180° upside down.

If the first Hall sensor 221 detects the first magnet 201, the direction detecting section 170 will generate a fourth direction detecting signal at step 613. Also, the control section 110 will read the generated fourth direction detecting signal at step 614. The generation of the fourth direction detecting signal means that the folder of the mobile terminal is turned 270° clockwise in opened state. In such a condition, the display section 160 initially displays a picture in a direction turned by the same angle. The picture should be turned 270° counter-clockwise to be seen in the upright direction. Also, the display section 160 should generate second picture data to display a full size picture, rather than a QCIF size picture. Upon detecting the second direction detecting signal at step 619, the control section 110 controls the display section 160 to generate the second picture data in a full size at step 631. At step 633, the control section 110 turns the second picture data 270° counter-clockwise to be seen in the upright direction. At step 635, the control section 110 controls the display section 160 to display the second picture data in a direction turned 270° counter-clockwise. Thus, the viewer can see the picture in the upright position even when the mobile terminal is turned 270° clockwise.

A mobile terminal capable of controlling image data according to the procedure as shown in FIG. 7 can have the structure as shown in FIG. 1. In other words, a mobile terminal having a general communication function, including character data communication, can implement the process as shown in FIG. 6 by controlling the direction of the visual display of data according to the direction of the mobile terminal, without the need to adjust the size of the data. A mobile terminal with a built-in camera displays a picture photographed by the camera (camera module 140) in a fixed size which is suitable to be displayed in the first direction. When the picture is displayed in the second or fourth direction, its size should preferably be adjusted.

FIGs. 4a to 4e are views showing the operation of the direction detecting section 170 according to the second embodiment of the present invention. In the second embodiment, the mobile terminal has three direction sensors in the main housing and four fixed projections in the folder housing. The three direction sensors detect four directions in which the display section 160 can be placed. Two of the four projections are provided on the inner side of the folder that faces the key input section 127, while the other two projections are provided on the outer side of the folder. It is assumed

that the direction sensors are Hall sensors (Hall effect ICs). The positions and numbers of the sensors and the projections may vary depending on the types of mobile terminals.

Referring to FIGs. 4a to 4e, the direction detecting section 170 consists of four projections 301 to 304 fixed on the folder of the mobile terminal and three Hall-sensors 321 to 323 mounted in the main housing to detect the projections 301 to 304 and generate a direction detecting signal. However, there is no limitation in the positions of the projections and the sensors. It is also possible to mount the projections in the main housing and the sensors in the folder. In the second embodiment of the invention, third and fourth projections 303 and 304 are provided on the inner side of the folder that faces the key input section 127, while first and second projections 301 and 302 are provided on the outer side of the folder. For explanatory convenience, it is supposed that the folders in FIGs. 4b to 4e are turned respectively in a first direction (turned  $0^\circ$  in opened state), a fourth direction (turned  $270^\circ$  clockwise in opened state), a second direction (turned  $90^\circ$  counter-clockwise in closed state) and a third direction (turned  $180^\circ$  in opened state).

When the second and third Hall sensors 322 and 323 simultaneously detect the first and second projections 301 and 302 as shown in FIG. 4e, the direction detecting section 170 generates a third direction detecting signal. When the second Hall sensor 322 detects the third projection 303 as shown in FIG. 4c, the direction detecting section 170 generates a second direction detecting signal. When the first Hall sensor 321 detects the first projection 301, the direction detecting section 170 generates a fourth direction detecting signal. Also, when the folder of the mobile terminal is closed as shown in FIG. 4a, the first Hall sensor detects the second projection 303 and at the same time the third Hall sensor 323 detects the fourth projection 304. When the folder of the mobile terminal is opened as shown in FIG. 4b so that the first and third Hall sensors 321 and 323 cannot detect the third and fourth projections 303 and 304, the direction detecting section 170 generates a first direction detecting signal. The first direction detecting signal is also generated when none of the Hall sensors 321 to 323 outputs a direction detecting signal.

The operation of a mobile terminal having the structure as shown in FIG. 1 will be explained in more detail with reference to FIGs. 2 to 4. When the folder housing is

opened to be apart from the main housing, the control section 110 controls the display section 160 to be in the display mode. The "display mode" includes both a communication mode and a mode for displaying image signals taken by the camera module 140.

In the display mode, the first to third Hall sensors 321 to 323 of the direction detecting section 170 detect the projections 301 to 304 fixed on the folder of the mobile terminal. The control section 110 reads the output from the direction detecting section 170 to determine the positional state (direction) of the folder of the mobile terminal. If outputs from the second and third Hall sensors 322 and 323 are simultaneously detected, the control section 110 will determine that the folder of the mobile terminal is turned 180° upside down in opened state. If an output from the second Hall sensor 322 is detected, the control section 110 will determine that the folder of the mobile terminal is turned 90° counter-clockwise in closed state. If an output from the first Hall sensor 321 is detected, the control section 110 will determine that the folder of the mobile terminal is turned 270° clockwise in opened state. Also, if no output from the Hall sensors 321 to 323 is detected, the control section 110 will determine that the folder of the mobile terminal is turned 0° and opened in a normal upright direction. The control section 110 controls the direction of a picture to be displayed on the display section 160 according to the output from the direction detecting section 170. The process of controlling the display direction of the display section 160 has been explained with reference to FIGs. 6 and 7.

FIGs. 5a to 5e are views showing the operation of the direction detecting section 170 according to the third embodiment of the present invention. In the third embodiment, the mobile terminal has three direction sensors in the main housing and one fixed projection and two magnets in the folder housing. The three direction sensors detect four directions in which the display section 160 can be placed. The projection is provided on the inner side of the folder that faces the key input section 127. It is assumed that the direction sensors are Hall sensors (Hall effect ICs). The positions and numbers of the sensors, projection and magnets may vary depending on the types of mobile terminals.

Referring to FIGs. 5a to 5e, the direction detecting section 170 consists of one projection 401 and two magnets 402 and 403 fixed on or within the folder housing and

three Hall sensors 421 to 423 mounted in the main housing to detect the projection 401 or the magnets 402 and 403 and generate a direction detecting signal. However, there is no limitation in the positions of the projection, magnets and sensors. It is also possible to mount the projection and the magnets in the main housing and the sensors in the folder. For explanatory convenience, it is supposed that the folders in FIGs. 5b to 5e are turned respectively in a first direction (turned 0° in opened state), a fourth direction (turned 270° clockwise in opened state), a second direction (turned 90° counter-clockwise in closed state) and a third direction (turned 180° in opened state).

When the folder of the mobile terminal is closed as shown in FIG. 5a, the first and second Hall sensors 421 and 422 detect the first and second magnets 402 and 403 and at the same time the third Hall sensor 423 detects the projection 401. When the folder of the mobile terminal is opened as shown in FIG. 5b so that the three Hall sensors 421 to 423 cannot detect the projection 401 or the magnets 402 and 403, the direction detecting section 170 generates a first direction detecting signal. The first direction detecting signal is also generated when none of the Hall sensors 421 to 423 outputs a direction detecting signal. When the second Hall sensor 422 detects the first magnet 402 as shown in FIG. 5d, the direction detecting section 170 generates a second direction detecting signal. When the first Hall sensor 421 detects the first magnet 402 as shown in FIG. 5c, the direction detecting signal 170 generates a fourth direction detecting signal. Also, when the first Hall sensor 421 detects the second magnet 403 and at the same time the second Hall sensor 422 detects the first magnet 402 as shown in FIG. 5e, the direction detecting signal generates a third direction detecting signal.

The operation of a mobile terminal having the structure as shown in FIG. 1 will be explained in more detail with reference to FIGs. 2 to 5. When the folder housing is opened to be apart from the main housing, the control section 110 controls the display section 160 to be in the display mode. The "display mode" includes both a communication mode and a mode for displaying image signals taken by the camera module 140.

In the display mode, the first to third Hall sensors 421 to 423 of the direction detecting section 170 detect the fixed projection 401 and the magnets 402 and 403 according to the direction in which the folder of the mobile terminal is placed. The control section 110 reads the output from the direction detecting section 170 to

determine the positional state (direction) of the folder of the mobile terminal.

If no output from the Hall sensors 421 to 423 is detected, the control section 110 will determine that the folder of the mobile terminal is turned  $0^\circ$  and opened in a normal upright direction. If an output from the second Hall sensor 422 is detected, the control section 110 will determine that the folder of the mobile terminal is turned  $90^\circ$  counter-clockwise in closed state. If an output from the first Hall sensor 421 is detected, the control section 110 will determine that the folder of the mobile terminal is turned  $270^\circ$  clockwise in opened state. Also, if outputs from the first and second Hall sensors 322 and 323 are simultaneously detected, the control section 110 will determine that the folder of the mobile terminal is turned  $180^\circ$  upside down in opened state. The control section 110 controls the direction of a picture to be displayed on the display section 160 according to the output from the direction detecting section 170. The process of controlling the display direction of the display section 160 has been explained with reference to FIGs. 6 and 7.

#### **[EFFECTS OF THE INVENTION]**

As described above, the present invention is to detect the direction of the folder of the mobile terminal and turns data to be displayed in the opposite direction thereby to be seen in the upright direction. Therefore, the viewer can always see pictures in the upright position, regardless of the direction of the folder of the mobile terminal. And the viewer can adjust the size of the data to be corresponding to changed size of the screen according to direction of the terminal.

[PATENT CLAIMS]

1. A device for displaying a picture in a mobile terminal, which comprises:

a direction detecting section consisting of at least one magnet fixed within the mobile terminal and a plurality of sensors for detecting the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and

a display section for displaying the picture data.

2. The device according to claim 1, wherein said direction detecting section consists of:

first and second magnets fixed within the mobile terminal; and

first to fourth sensors for detecting the first and second magnets according to the direction in which the mobile terminal is turned and generating a corresponding direction detecting signal.

3. the touch sensor as claimed in claim 2, wherein at least one sensor of the sensors detects the first or second magnet and generates direction signal.

4. The touch sensor as claimed in claim 2, wherein two sensors of the sensors detects the first and the second magnet at the same time and generates direction signal.

5. The sensor as claims in claim 2, wherein the sensors generate the direction signal without detecting the magnet.

6. the direction detecting section as claimed in claim 2, wherein the magnets of the direction detecting section are fixed to the folder housing of the mobile terminal, and sensors are fixed to the main housing of the mobile terminal.

7. The direction detecting unit as claimed in claim 2, the magnets of the direction detecting unit are fixed to the main housing of the mobile terminal, and the sensors are fixed to the folder housing of the mobile terminal.

8. A device for displaying a picture in a mobile terminal, which comprises:  
a camera module for taking an image signal;  
an image processing section for processing the image signal taken by the camera module in a display picture size;  
a direction detecting section consisting of at least one magnet fixed within the mobile terminal and a plurality of sensors for detecting the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and  
a display section for displaying the picture data.

9. A device for displaying a picture in a mobile terminal, which comprises:  
a tuner for receiving a composite television video signal broadcasted on a selected channel;  
a decoder for decoding the composite video signal to generate an analog video signal and a synchronizing signal;  
a video processing section for converting the analog video signal into a digital video data, processing the digital video data in a frame size and outputting a frame video signal and user data in the frame;  
a direction detecting section consisting of at least one magnet fixed within the mobile terminal and a plurality of sensors for detecting the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;  
a control section for outputting picture data in an upright direction when a first

direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and

a display section for displaying the picture data.

10. A device for displaying a picture in a mobile terminal, which comprises:

a direction detecting section consisting of at least one projection fixed on the mobile terminal and a plurality of sensors for detecting the projection in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and

a display section for displaying the picture data.

11. The device according to claim 5, wherein said direction detecting section consists of:

first to fourth projections fixed on the mobile terminal; and

first to third sensors for detecting the first to fourth projections according to the direction in which the mobile terminal is turned and generating a corresponding direction detecting signal.

12. A device for displaying a picture in a mobile terminal, which comprises:

a camera module for taking an image signal;

an image processing section for processing the image signal taken by the camera module in a display picture size;

a direction detecting section consisting of at least one projection fixed on the

mobile terminal and a plurality of sensors for detecting the projection in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and

a display section for displaying the picture data.

13. A device for displaying a picture in a mobile terminal, which comprises:

a tuner for receiving a composite television video signal broadcasted on a selected channel;

a decoder for decoding the composite video signal to generate an analog video signal and a synchronizing signal;

a video processing section for converting the analog video signal into a digital video data, processing the digital video data in a frame size and outputting a frame video signal and user data in the frame;

a direction detecting section consisting of at least one projection fixed on the mobile terminal and a plurality of sensors for detecting the projection in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and

a display section for displaying the picture data.

14. A device for displaying a picture in a mobile terminal, which comprises:

a direction detecting section consisting of at least one projection and at least one magnet fixed on or in the mobile terminal and a plurality of sensors for detecting the projection or the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and

a display section for displaying the picture data.

15. The device according to claim 9, wherein said direction detecting section consists of:

one projection and first and second magnets fixed on or in the mobile terminal; and

first to third sensors for detecting the projection and the magnets according to the direction in which the mobile terminal is turned and generating a corresponding direction detecting signal.

16. A device for displaying a picture in a mobile terminal, which comprises:

a camera module for taking an image signal;

an image processing section for processing the image signal taken by the camera module in a display picture size;

a direction detecting section consisting of at least one projection and at least one magnet fixed on or in the mobile terminal and a plurality of sensors for detecting the projection or the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise

when a fourth direction detecting signal is generated; and  
a display section for displaying the picture data.

17. A device for displaying a picture in a mobile terminal, which comprises:

a tuner for receiving a composite television video signal broadcasted on a selected channel;

a decoder for decoding the composite video signal to generate an analog video signal and a synchronizing signal;

a video processing section for converting the analog video signal into a digital video data, processing the digital video data in a frame size and outputting a frame video signal and user data in the frame;

a direction detecting section consisting of at least one projection or at least one magnet fixed on or in the mobile terminal and a plurality of sensors for detecting the projection or the magnet in order to detect the direction in which the mobile terminal is turned and generate first to fourth direction detecting signals;

a control section for outputting picture data in an upright direction when a first direction detecting signal is generated, in a direction turned 90° counter-clockwise when a second direction detecting signal is generated, in a direction turned 180° when a third direction detecting signal is generated, or in a direction turned 270° counter-clockwise when a fourth direction detecting signal is generated; and

a display section for displaying the picture data.

18. A method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one fixed magnet and a plurality of sensors for detecting the magnet, said method comprising the steps of:

detecting a direction signal informing the direction in which the mobile terminal is turned, using the sensors for detecting the magnet;

when no direction signal is received from the sensors, making same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction;

when a second direction signal is detected, outputting and displaying the

picture data in a direction turned 90° counter-clockwise;

when a third direction signal is detected, displaying the picture data in a direction turned 180°; and

when a fourth direction signal is detected, outputting and displaying the picture data in a direction turned 270° counter-clockwise.

19. A method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one fixed magnet and a plurality of sensors for detecting the magnet, said method comprising the steps of:

detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the magnet;

when no direction signal is received from the sensors, making same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction;

when a second direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 90° counter-clockwise;

when a third direction signal is detected, displaying the picture data in a direction turned 180°; and

when a fourth direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 270° counter-clockwise.

20. The method as claimed in claim 18 or 19, if composed of first and second magnets and first to fourth sensors for detecting the first and second magnets, at least one sensor of the first -fourth sensors generates the second or the fourth direction signal by detecting the first or the second magnet.

21. The method as claimed in claims 18 or 19, , if composed of first and second magnets and first to fourth sensors for detecting the first and second magnets, two sensors of the first-fourth sensor detects the first and the second magnet at the same time, then generates the first direction signal.

22. The method as claimed in claims 18 or 19, , if composed of first and second magnets and first to fourth sensors for detecting the first and second magnets, two

sensors of the first-fourth sensor detects the first and the second magnet at the same time, then detects the folder whether it is closed.

23. A method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection and a plurality of sensors for detecting the projection, said method comprising the steps of:

detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the projection;

when no direction signal is received from the sensors, making same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction;

when a second direction signal is detected, outputting and displaying the picture data in a direction turned 90° counter-clockwise;

when a third direction signal is detected, displaying the picture data in a direction turned 180°; and

when a fourth direction signal is detected, outputting and displaying the picture data in a direction turned 270° counter-clockwise.

24. A method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection and a plurality of sensors for detecting the projection, said method comprising the steps of:

detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the projection;

when no direction signal is received from the sensors, making same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction;

when a second direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 90° counter-clockwise;

when a third direction signal is detected, displaying the picture data in a direction turned 180°; and

when a fourth direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 270° counter-clockwise

25. A method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection, at least one magnet and a plurality of sensors for detecting the projection or the magnet, said method comprising the steps of:

detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the projection or the magnet;

when no direction signal is received from the sensors, making same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction;

when a second direction signal is detected, outputting and displaying the picture data in a direction turned 90° counter-clockwise;

when a third direction signal is detected, displaying the picture data in a direction turned 180°; and when a fourth direction signal is detected, outputting and displaying the picture data in a direction turned 270° counter-clockwise.

26. A method for displaying a picture on a mobile terminal which includes a direction detecting section consisting of at least one projection, at least one magnet and a plurality of sensors for detecting the projection or the magnet, said method comprising the steps of:

detecting a direction signal informing the direction in which the mobile terminal is turned, using a sensor contacting the projection or the magnet;

when no direction signal is received from the sensors, making same determination as when a first direction signal is detected and outputting and displaying picture data in an upright direction;

when a second direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 90° counter-clockwise;

when a third direction signal is detected, displaying the picture data in a direction turned 180°; and

when a fourth direction signal is detected, generating full size picture data and displaying the picture data in a direction turned 270° counter-clockwise.

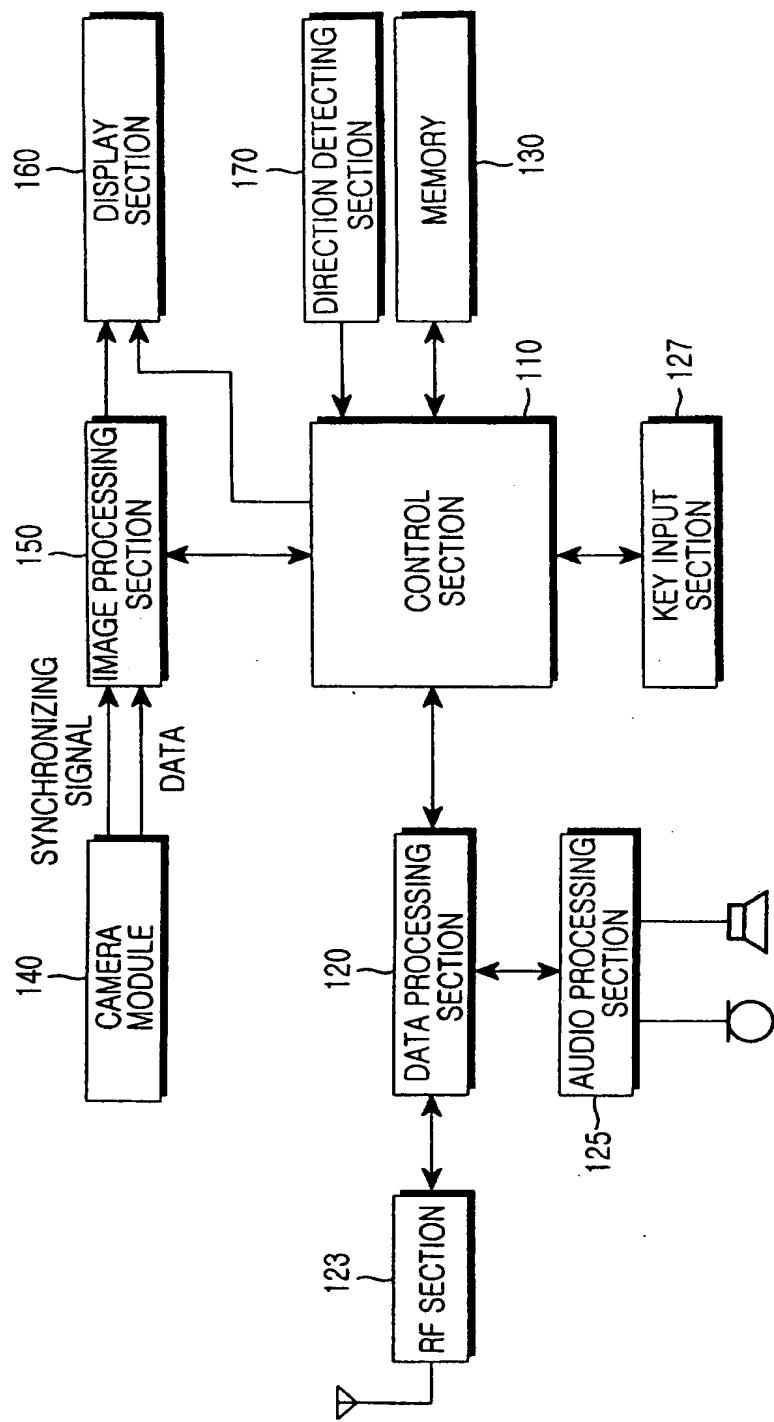
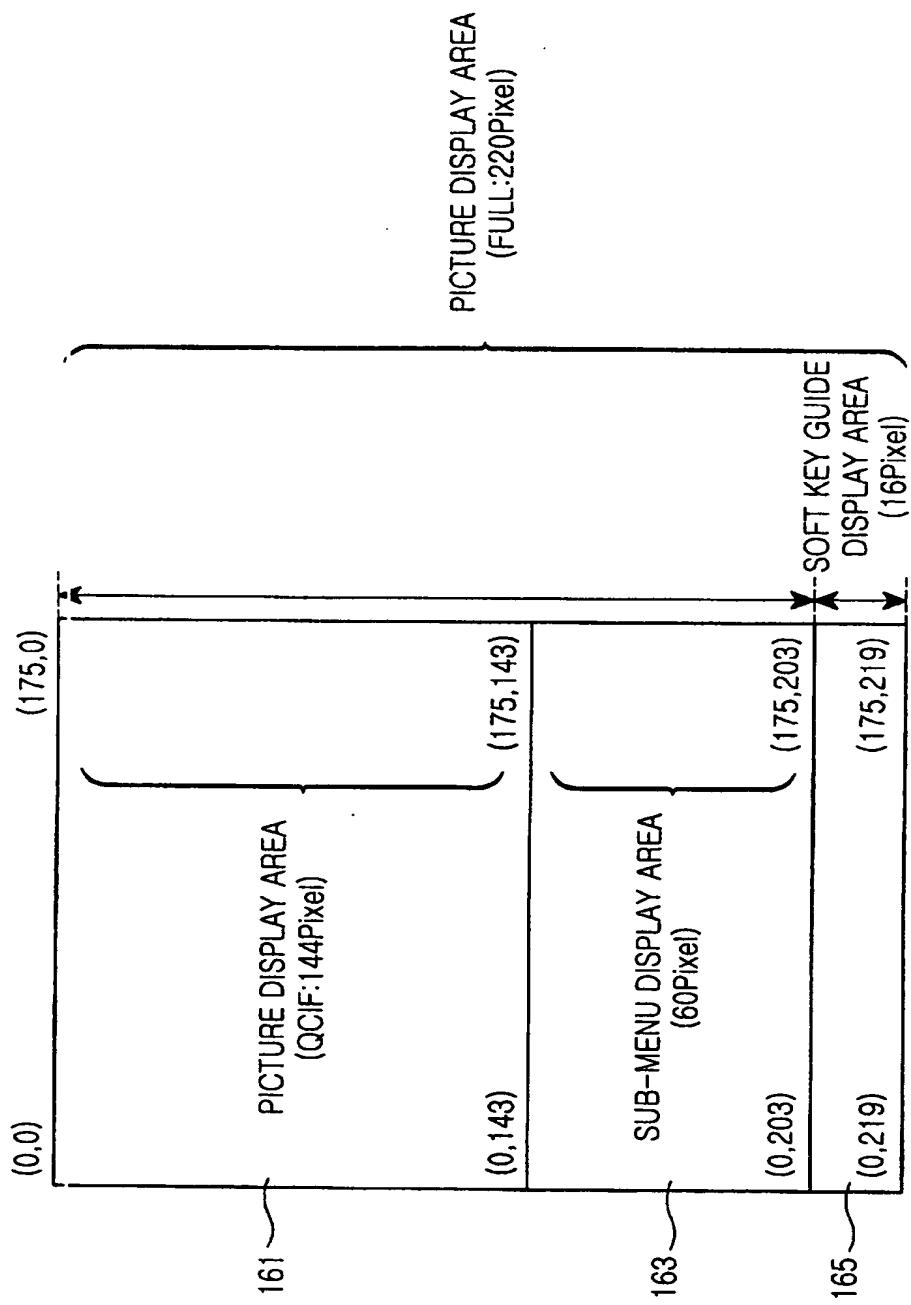


FIG. 1



- \* SUB-MENU DISPLAY AREA HAS FONT SIZE  $(18 \times 19) \times 3$  LINES = 57 PIXELS + 3 PIXEL MARGIN = 60 PIXELS
- \* TV DISPLAY AREA (IN FULL SIZE)  $\rightarrow$  USES  $176 \times 220$

FIG.2

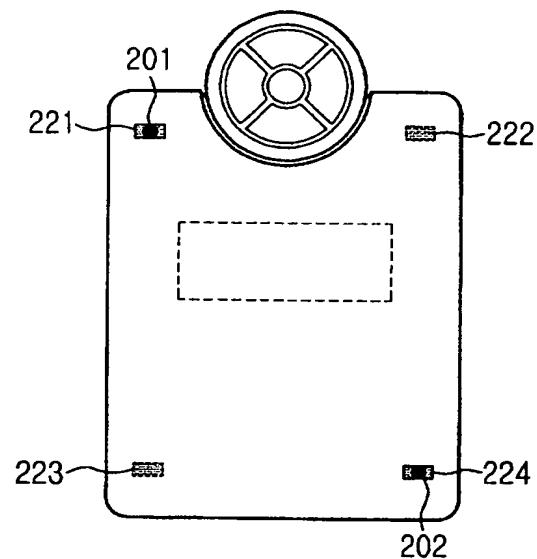


FIG.3A

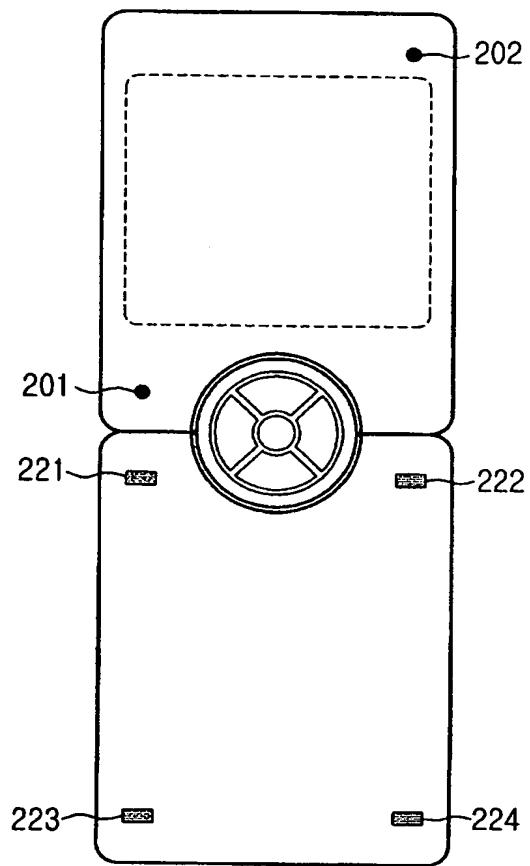


FIG.3B

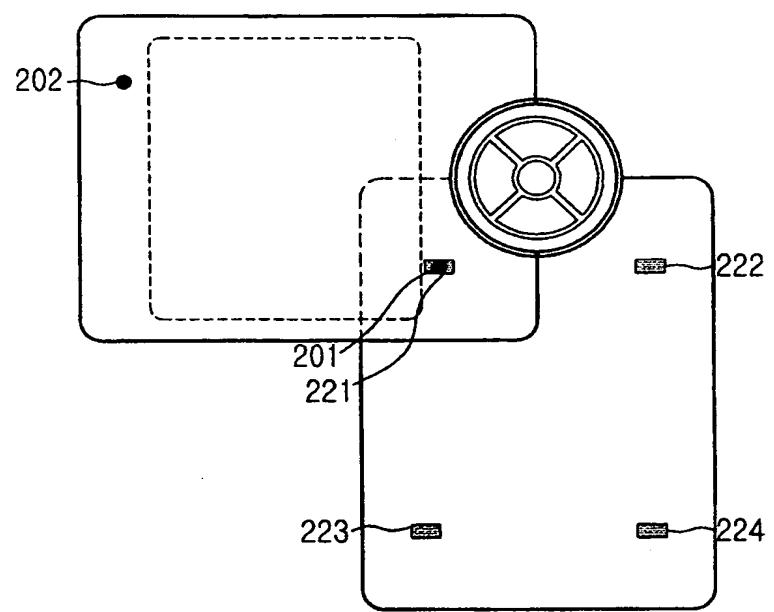


FIG.3C

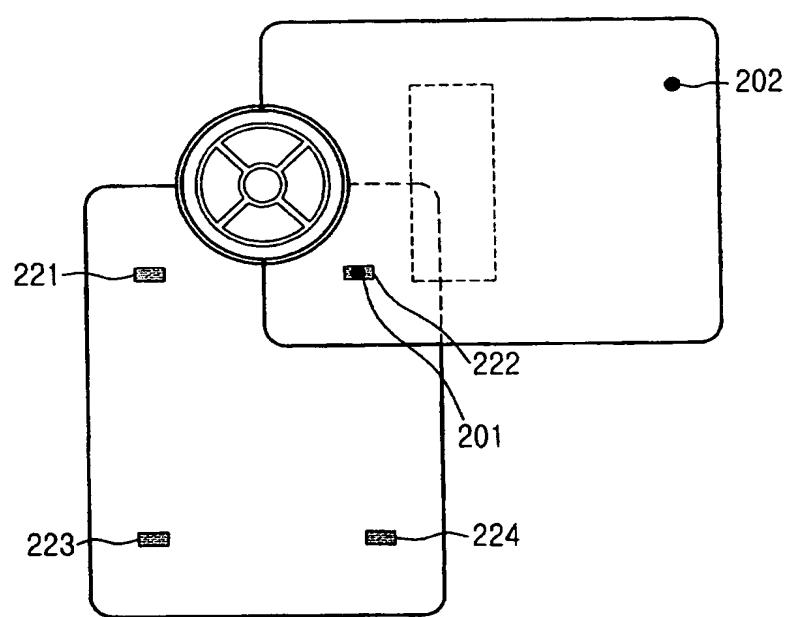


FIG.3D

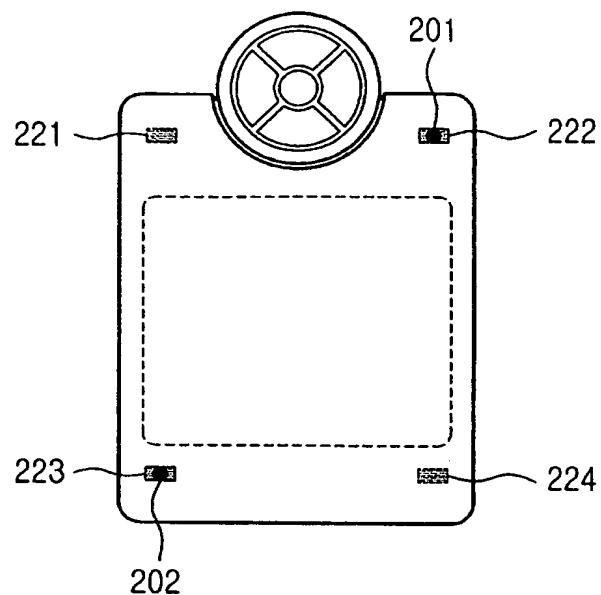


FIG.3E

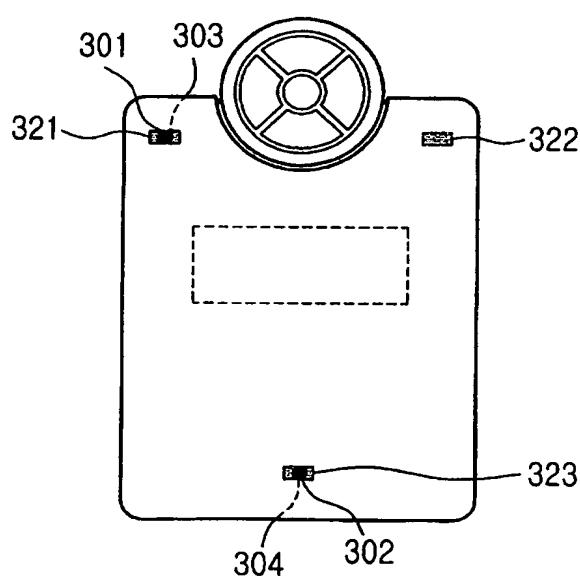


FIG.4A

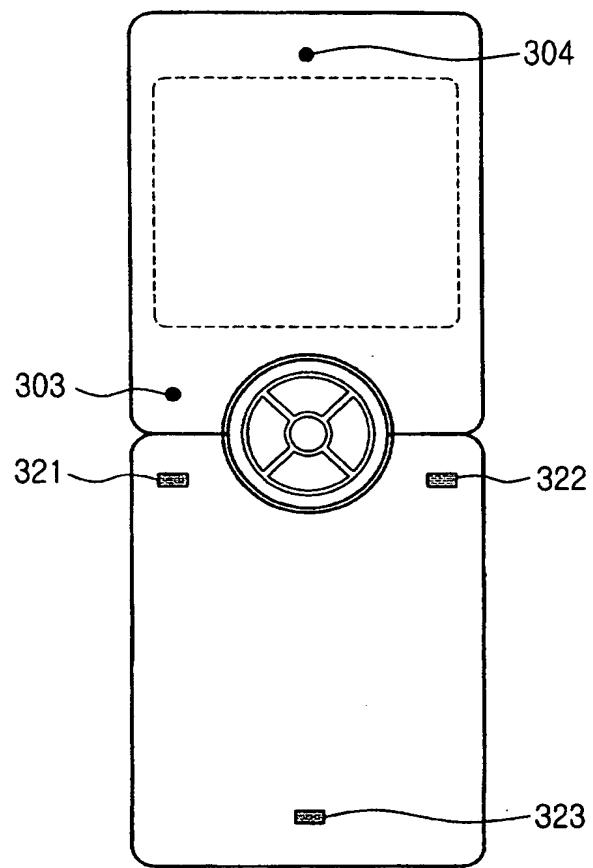


FIG.4B

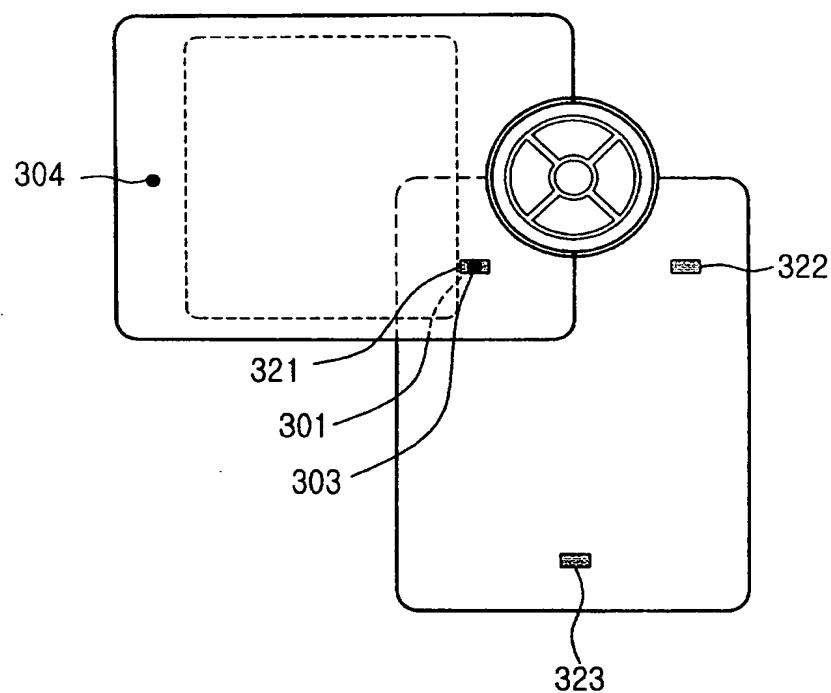


FIG.4C

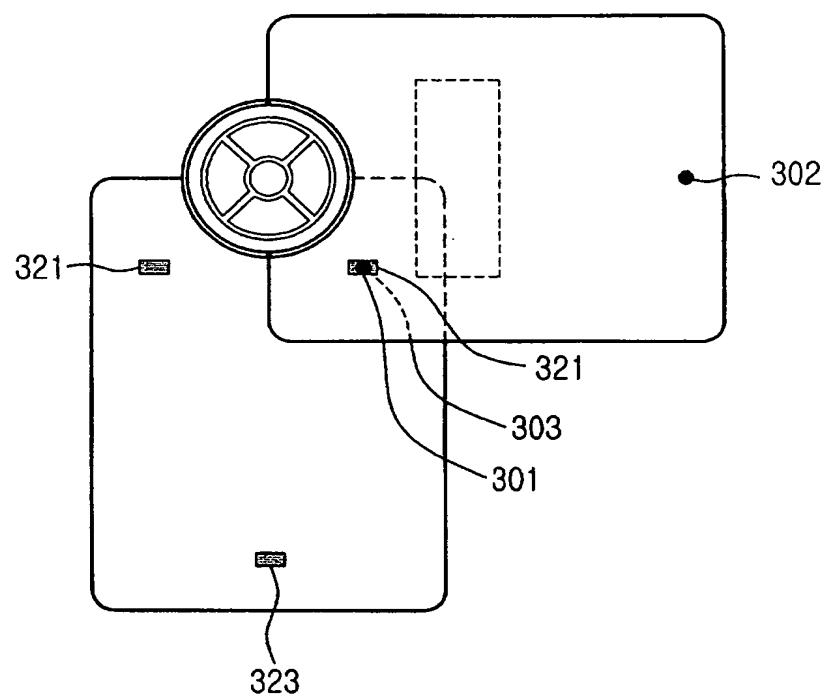


FIG.4D

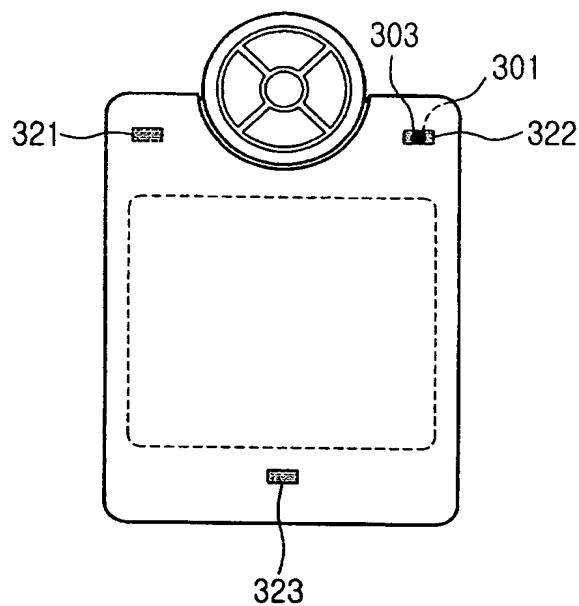


FIG.4E

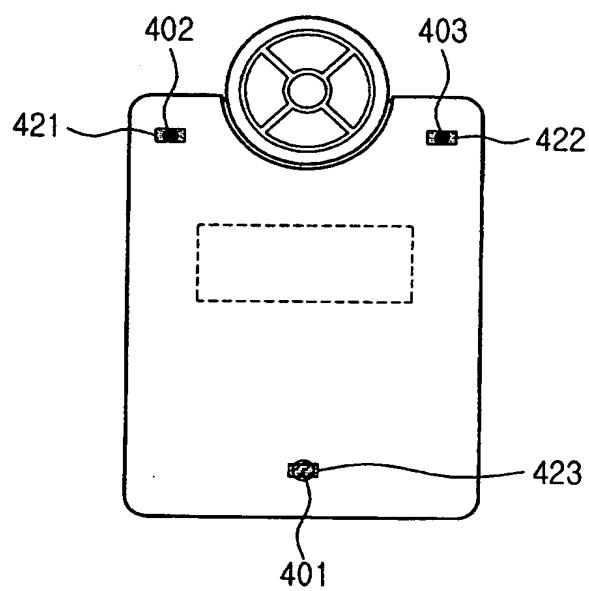


FIG.5A

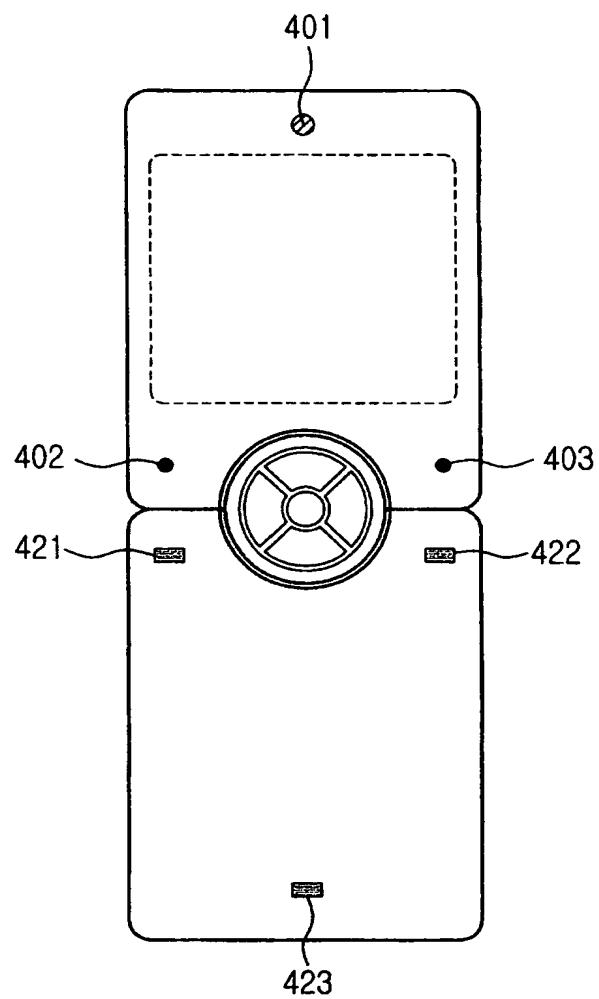


FIG.5B

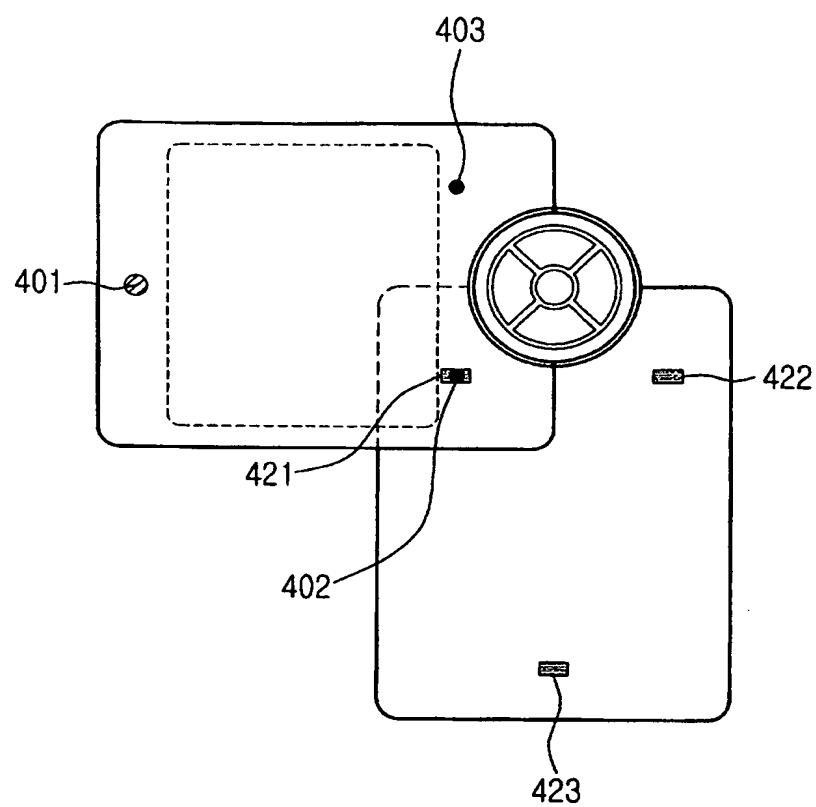


FIG.5C

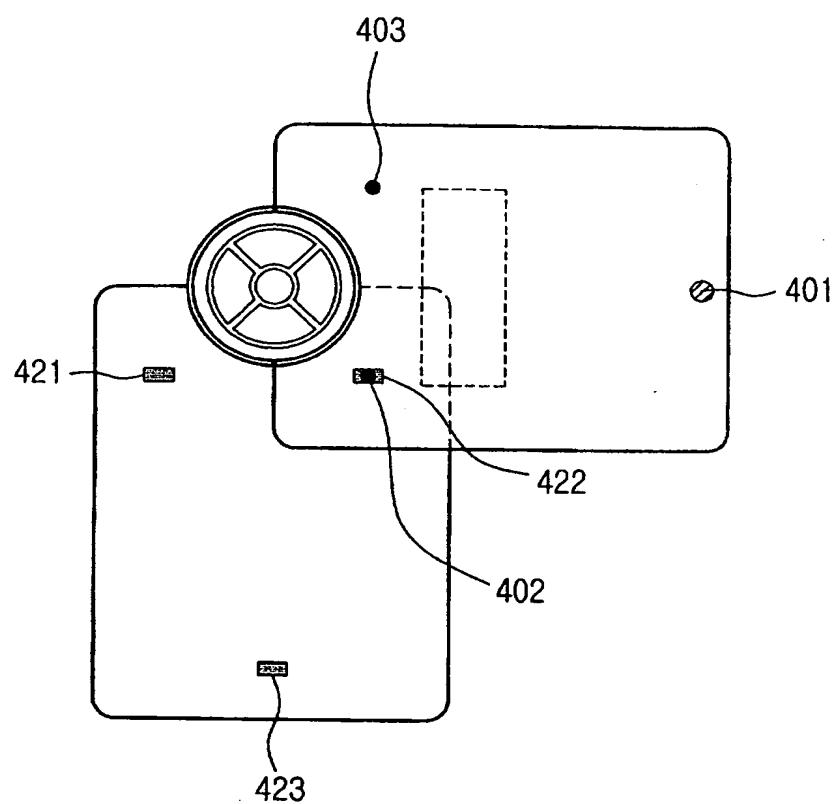


FIG.5D

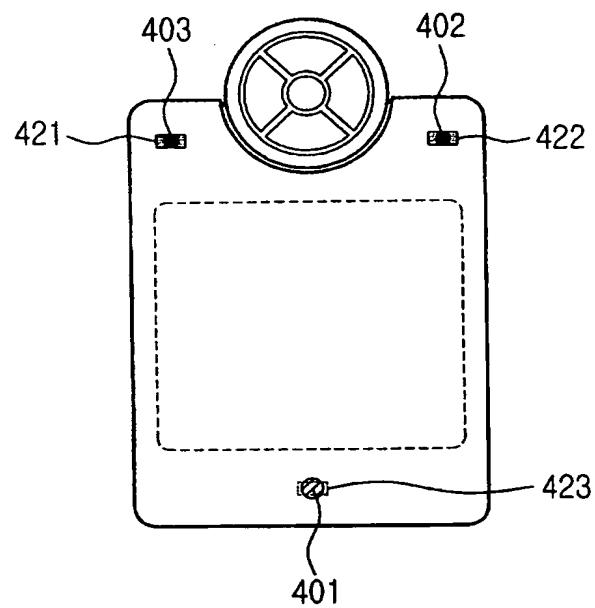


FIG.5E

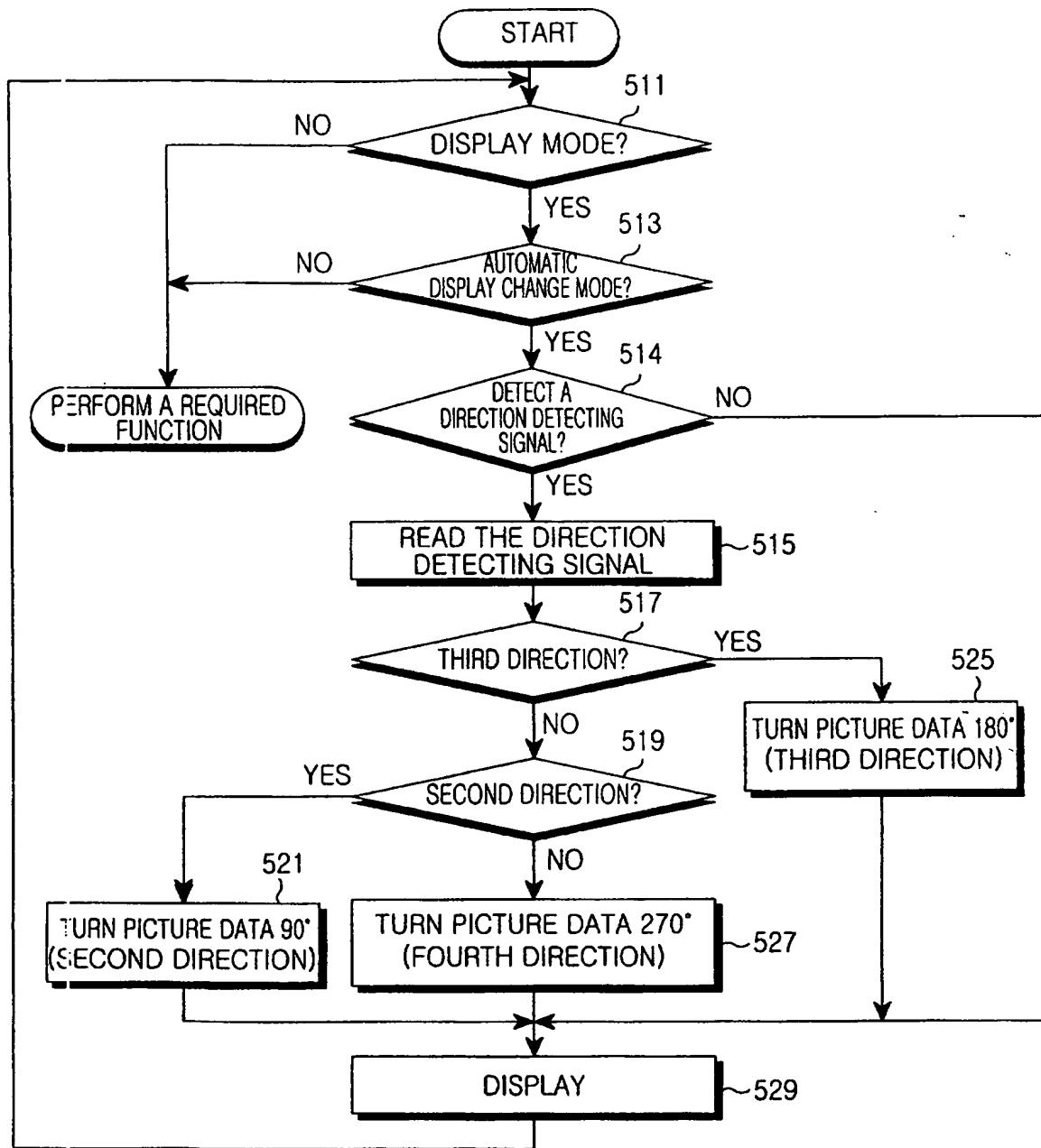


FIG.6

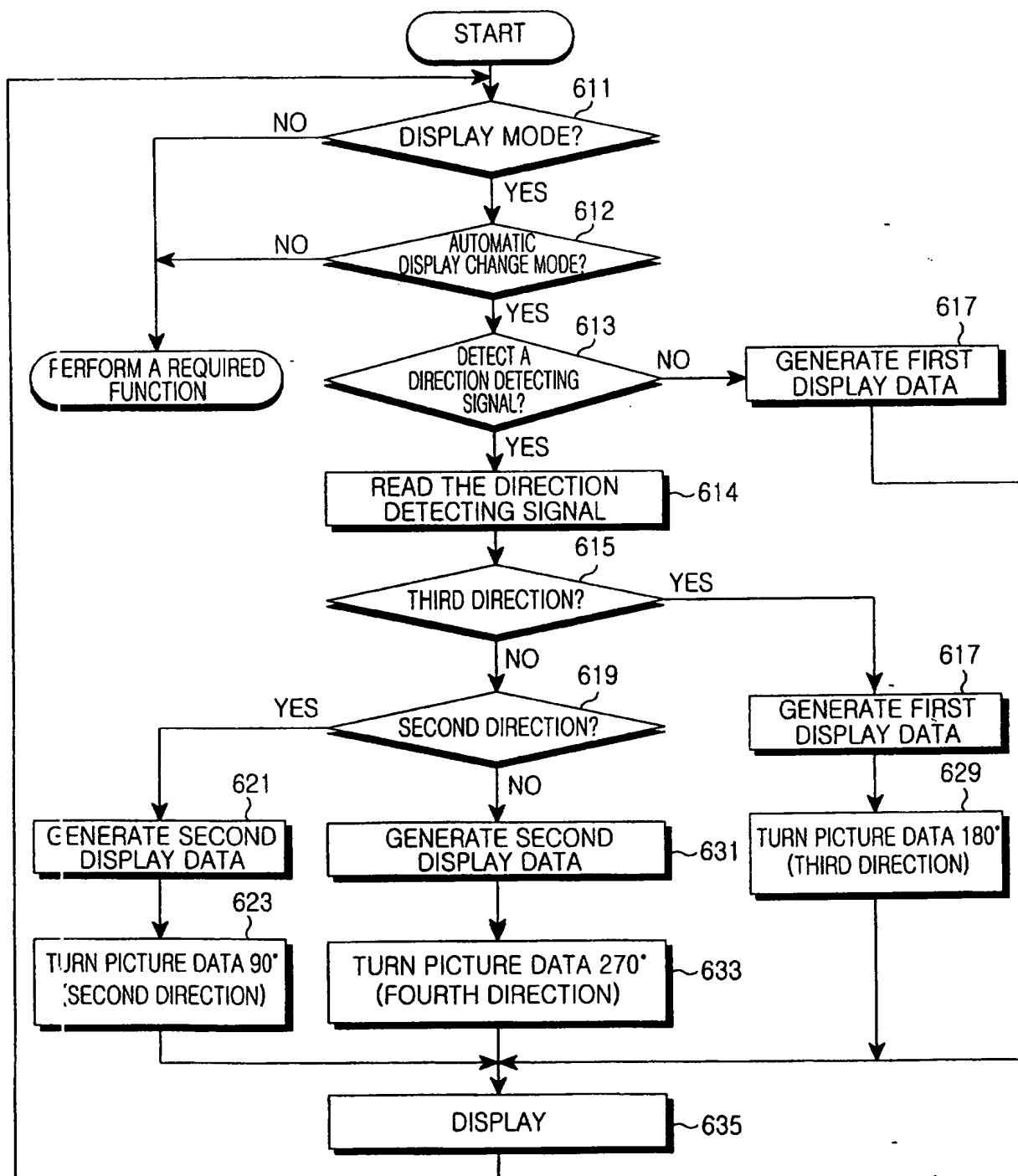


FIG.7